STRESS ECHOCARDIOGRAM

Non-ischemic indications

INDICATION	EVALUATION	IYPE
Diastolic function	Diastolic dysfunction	Physical
	Increase in PASP and E/E'	
	Correlation of symptoms/signs of HEART FAILURE	
CARDIOMYOPA	THIES	
Hypertrophic	Dynamic obstruction to LV outflow tract	Physical
cardiomyopathy	Diastolic dysfunction	
caraiomyopathy	Dynamic mitral insufficiency	
	Inducible ischemia and correlation with symptoms	
	Timing of thorapy and surgery	
	Lifectule adjustment	
Dilatativa	Lifestyle adjustment	Dhusiaal
	Contractile reserve (increase in $EF > 5\%$ of GLS	Physical
cardiomyopathy	strain $> -2\%$	
	Inducible ischemia	
	Diastolic reserve	
	PAsP variations	
	Dynamic mitral insufficiency	
	Pulmonary congestion	
Cardiac	Contractile reserve	Dobutamine
resynchronization	Inducible ischemia	
therapy	Contractile reserve	Physical
	Vitality in scarring areas	Dobutamine
	Dynamic dyssynchrony	
NATIVE VALVU	LAR HEART DISEASE	
Aortic stenosis	Asymptomatic severe aortic stenosis	Physical
	Symptomatic non-severe aortic stenosis	Physical/dobutamine
	Low-flow/low-gradient aortic stenosis	Physical/dobutamine
Primitivo mitrol	Asymptomatic sovere partic mitral insufficiency	Physical
incufficional	Symptomatic pop covere mitral insufficiency	Physical
Insumciency Secondary mitral	Variations in the soverity of mitral insufficiency	Physical
Secondary milital	with eventing	Physical
insumciency	with exercise	
	Increase in PASP	
	Asymptomatic mitral insufficiency	Physical
Aortic insufficiency	Symptomatic non-severe aortic insufficiency	Physical
	Asymptomatic severe aortic mitral insufficiency	Physical
Mitral stenosis	Symptomatic non-severe mitral stenosis	Physical/dobutamine
Multivalvular	Discordance of symptoms/severity of valve	Physical
pathology	pathology	
PROSTHESES		
Prosthetic aortic	Stenosis	Physical/dobuta-
valves	Prosthesis/patient match with or without low-flow	mine
Prosthetic mitral	Stenosis	Physical/dobuta-
valves	Prosthesis/patient match	mine
Mitral valve	latrogenic mitral stenosis	Physical
annulonlasty	latrogenie mital stenosis	riysical
	VDEDTENCION	
		Dhusical
Pulmonary	Symptoms and pulmonary pressure during	Physical
hypertension	exertion	
Pulmonary heart	RV contractile reserve	Physical
	PASP	
ATHLETE'S HEA	RT	
Symptomatic athletes	Assessment of exercise response and symptoms	Physical
CONGENITAL H	EART DISEASE	
Interatrial defect	PASP	Physical
	RV contractile reserve	1 Hjorean
	RV contractile reserve	Dobutamine
Tetralogy of Fallet	RV contractilo recorvo	Physical
Ichalogy OF FallOL	IV contractile reserve	ritysical
Convetation of the	Ly contractile reserve	Dhysical
Coarctation of the	Assessment of the degree of severity	Physical
aorta	LV CONTRACTILE RESERVE	
Univentricular heart	Assessment of contractile reserve	Physical
	Hemodynamic stress assessment	
D'Andrea A, Martone F, Liccardo B, Integrated recommendations from the European Associat	Cardiological Diagnostics, Ospedali dei Colli hospital, Monaldi - Lancellotti P, et al. The clinical use of stress ech tion of Cardiovascular Imaging and the American Society of Echocardiography J Am Soc Echocardiogr. 2017 Feb	hocardiography in nonischaemic heart disease ;30(2):101-138 - Sicari R, Cortigiani L The

Ischemic indications

- Study of global and regional kinesis
- Assessment of coronary flow reserve
- Assessment of ischemia that may be induced in high-risk cardiovascular patients
- Stratification of risk and prognosis in patients with established diagnosis (post-SCA)
- Assessment of pre-operative risk in ischemic patients, high-risk cardiovascular patients and patients with poor tolerance of physical exertion
- Etiological assessment of dyspnea due to exertion
- Follow-up subsequent to percutaneous or surgical revascularization
- Assessment of ischemia that may be induced and myocardial vitality in patients with chronic ischemic heart disease
- Assessment of intermediate grade coronary artery disease (coronography/coronary CT scan)



PROVOCATIVE TEST					
PATIENT CAPABLE OF PHYSICAL EXERCISE					
YE	S		ΝΟ		
BASIC ECG:		PHYSICALLY OR M	ENTALLY UNABLE		
Left branch block		IO EXERCISE DUE IO:			
Depression of ST segies 1 mm	ment at rest	Neurological or psychiatric disorder			
PMK rhvthm		Prosthetic lea			
Wolff-Parkinson-Whit	te syndrome	Invalidating arthritis			
Signs of hypertrophic	left ventricle	Limp			
Digoxin effect		Severe lower limb phlebopathy, etc.			
VES	NO	Severe obesity and C	OPD		
		~			
ECHOCARDIOG	S SRAM	TRESS ECG			
POSITIVE NE	GATIVE NEGATIVE	POSITIVE			
	\uparrow \uparrow \downarrow				
Coronary	ollow	Coronary			
angiography	Up Up	angiography			
PHARMACOLOGICAL STRESS ECHOCARDIOGRAM					
DOBUTAMINE		DIPYRIDAMOLE			
(inotropic effect)		(vasodilatatory ef	fect)		
Low dose: assessmen	t of vitality	Maximum dose			
(10 γ /kg/min) High dose: assessment of ischemia		0.84 mg/kg in 6 min + atropine (0.5 mg/1 ml)			
(up to 40 γ /kg/min)	ml)	Preferable in patients	with:		
+ atropine (0.5 mg/1 ml) - Moderate/severe hypertension			pertension		
- Severe asthma/COPD		- History of atrial or ve	entricular tachycardia		
 Carotid stenosis History of bradyarrh 	ythmia				
POSITIVE	NEGATIVE	NEGATIVE	POSITIVE		
Coronary angiography	Follow Up	Follow Up	Coronary angiography		
- Carotid stenosis - History of bradyarrh POSITIVE Coronary angiography	ythmia NEGATIVE Follow Up	NEGATIVE Follow Up	POSITIVE Coronary angiography		

Worsening **ISCHEMIA** No change **NECROSIS** Sustained improvement VITAL Response in two phases

Diagnostic criteria

- Maximum heart rate
- Echocardiographic positivity (new akinesia, worsening of ischemia)

VITAL ISCHEMIC

- Chest pain
- Changes to ECG (alteration of st > 2 mm segment)



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clinical use of stress echocardiography in ischemic heart disease Cardiovasc Ultrasound. 2017 Mar 21;15(1):7

Dobutamine Indications

- Identification of myocardiac ischemia
- Identification of myocardiac vitality

Contraindications

- Repetitive atrial arrhythmias (atrial fibrillation, supraventricular paroxysmal tachycardia) - Complex ventricular arrhythmias (polymorphous extrasystoles, ventricular tachycardia) - Moderate to severe arterial hypertension

Dipyridamole

Indications

- Identification of myocardiac ischemia

Contraindications

- 2nd and 3rd degree AV block
- Sinus node disease

- Aortic aneurism

Dosage scheme

1 fl dobutamine (250 mg in 30 ml) + 20 ml saline solution (concentration 5000 γ /ml)

		Infu	sion speed (n	ו/h)	
	0 minutes	3 minutes	6 minutes	9 minutes	12 minutes
Weight (kg)	5 γ/kg/min	10 γ/kg/min	20 γ/kg/min	30 γkg/min	40 γ/kg/min
50	3.0	6.0	12.0	18.0	24.0
60	3.6	7.2	14.4	21.6	28.8
65	3.9	7.8	15.6	23.4	31.2
70	4.2	8.4	16.8	25.2	33.6
75	4.5	9.0	18.0	27.0	36.0
80	4.8	9.6	19.2	28.8	38.4
85	5.1	10.2	20.4	30.6	40.8
90	5.4	10.8	21.6	32.4	43.4
95	5.7	11.4	22.8	34.2	45.6
100	6.0	12.0	24.0	36.0	48.0

Dobutamine (γ/kg/min) Atropine 1 fl 10 20 30 40 High doses Beta blocker Low doses Minutes

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21

12 Antonello D'Andrea and Ercole Tagliamonte, Presidio Ospedaliero Umberto I, Nocera Inferiore, Salerno; Francesca Martone and Biagio Liccardo, AORN Ospedali dei Colli, Napoli; University of Campania Luigi Vanvitelli;

9

Marco Maglione, GMKT Esaote

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- Bronchial asthma
- Significant carotid artery stenosis (common or internal carotid artery > 50%)

Contraindications for atropine

- Glaucoma
- Severe prostate hypertrophy

Dosage scheme

Dipyridamole (10 mg/² ml) by body weight to be administered slowly by bolus in 6 minutes

Number of vial	s to administer
Weight (kg)	Dosage
50	4 and 1/2
60	5 and 1/4
70	6
80	6 and 3/4
90	7 and 1/2
100	8 and 1/4
110	9

Dipyridamole	Atropine	Aminophylline
Dosage for body weight	1 fl	





